



RADIO TEST REPORT

Product : Terminal
Model Name : xCL_AT-170-R-18W
Series Model : Utimaco C3
FCC ID : MQT-AT170R18W
Test Regulation : FCC 47 CFR Part 15 Subpart C (Section 15.225)
Received Date : 2021/6/2
Test Date : 2021/6/2 ~ 2021/6/29
Issued Date : 2021/8/3

Applicant : XAC Automation Corporation
4F., No. 30 Industry E. Road IX, Science-Based
Industrial Park Hsin-Chu, 300, Taiwan, ROC

Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4,
Zhongxing Rd., Zhudong Township, Hsinchu County,
Taiwan



The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Telephone : +886-2-7737-3000
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



Test report No. : 4789969990-US-R5-V0
Page : 2 of 36
Issued date : 2021/8/3
FCC ID : MQT-AT170R18W

REVISION HISTORY

Original Test Report No.: 4789969990-US-R5-V0

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Building B and Building E, No. 3727,
Telephone :+886-2-7737-3000

Telephone :+886-2-7737-5000
Facsimile (FAX) :+886-3-583-7948

Facsimile (FAX) :+880-3-585-7548

Doc No: 17-EM-F0875 / 5.0



Table of Contents

1. Attestation of Test Results	4
2. Summary of Test Results	5
3. Test Methodology and Reference Procedures.....	6
4. Facilities and Accreditation.....	6
5. Measurement Uncertainty.....	7
6. Equipment under Test	8
6.1. Description of EUT	8
6.2. Test Condition.....	10
6.3. Channel List.....	11
6.4. Description of Available Antennas	11
6.5. Test Mode Applicability and Tested Channel Detail.....	12
7. Test Equipment.....	13
8. Description of Test Setup.....	14
9. Test Result	16
9.1. Radiated Spurious Emission	16
9.2. AC Power Line Conducted Emission	27
9.3. 20dB Bandwidth	33
9.4. Frequency Stability	35

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



1. Attestation of Test Results

APPLICANT: XAC Automation Corporation
4F., No. 30 Industry E. Road IX, Science-Based Industrial Park Hsin-Chu, 300, Taiwan, ROC

MANUFACTURER: XAC Automation Corporation
4F., No. 30 Industry E. Road IX, Science-Based Industrial Park Hsin-Chu, 300, Taiwan, ROC

EUT DESCRIPTION: Terminal

BRAND: XAC, Utimaco

MODEL: xCL_AT-170-R-18W

SERIES MODEL: Utimaco C3

SAMPLE STAGE: Engineering Verification Test sample

DATE of TESTED: 2021/6/2 ~ 2021/6/29

APPLICABLE STANDARDS	
STANDARD	Test Results
FCC 47 CFR PART 15 Subpart C (Section 15.225)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Sally Lu
Project Handler

Date : 2021/8/3

Approved and Authorized By:

Mike Cai
Engineer Project Associate

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



2. Summary of Test Results

FCC Clause	Test Item	Result
15.203	Antenna requirement	PASS
15.207	AC Power Conducted Emission	PASS
15.215 (c)	20dB Bandwidth	PASS
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	PASS
15.225 (b)	The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	PASS
15.225 (c)	The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	PASS
15.225 (d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band	PASS
15.225 (e)	The frequency tolerance	PASS

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB174176 D01 Line Conducted FAQ v01r01, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=3398

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	±3.1 dB
RF Conducted	9 kHz - 40GHz	±1.9 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	±1.9 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	±5.4 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	±4.7 dB

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



6. Equipment under Test

6.1. Description of EUT

Product	Terminal
Brand Name	XAC, Utimaco
Model Name	xCL_AT-170-R-18W
Series Model	Utimaco C3
Operating Frequency	13.56 MHz
Modulation	ASK
Maximum Field Strength (dBuV/m)	83.79 dBuV/m
Normal Voltage	5Vdc from adapter or host 3.8Vdc from battery
S/N	Conducted Test: 1740D2103 Radiated Test: 1740D2107
Sample ID	Conducted Test: 3949576 Radiated Test: 3949578
Software Version	Android Version: 8.1.0 Kernel Version: 3.18.71 (gcc version 4.8(GCC))

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



Note:

1. The models difference table as below:

Main Model Name		
Brand	Model	Difference
XAC	xCL_AT-170-R-18W	-
Series Model Name		
Brand	Model	Difference
Utimaco	Utimaco C3	For market segmentation

2. The EUT could be supplied with rechargeable battery as the following table:

Brand Name	Model	Description
Shenzhen Rishengzhi Electronics Technology Co., Ltd.	J601	3.8Vdc, 5200mAh

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



Test report No. : 4789969990-US-R5-V0
Page : 10 of 36
Issued date : 2021/8/3
FCC ID : MQT-AT170R18W

6.2. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Frequency Stability Measurement	SR4	22~26°C/ 62~68%RH	3.8Vdc	2021/06/11~ 2021/06/24	Patrick Kuan
Radiated Spurious Emission	966-2	22~26°C/ 62~68%RH	5Vdc from adapter	2021/06/02~ 2021/06/24	Patrick Kuan
AC power Line Conducted Emission	SR1	22~26°C/ 62~68%RH	5Vdc from adapter	2021/06/16~ 2021/06/29	Patrick Kuan

FCC Test Firm Registration Number: 498077

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



Test report No. : 4789969990-US-R5-V0
Page : 11 of 36
Issued date : 2021/8/3
FCC ID : MQT-AT170R18W

6.3. Channel List

1 channel is provided to this EUT:

Channel	Frequency (MHz)
1	13.56

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Ant. Type	Maximum Gain (dBi)
1	Chain (0)	XAC	RTOS	wire	-

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



6.5. Test Mode Applicability and Tested Channel Detail

- The EUT has three power source types: 3.8Vdc from battery, 5V from host and 5V from adapter. Three types were pre-tested, the worst case was found in the 5Vdc from adapter. Therefore, only the test data of the 5Vdc from adapter was recorded in this report.
- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Z axis was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Z axis.
- For below 30MHz Radiated Emission Measurement, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



Test report No. : 4789969990-US-R5-V0
Page : 13 of 36
Issued date : 2021/8/3
FCC ID : MQT-AT170R18W

7. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Expired date
Spectrum Analyzer	Keysight	N9010A	MY56070827	2020/11/11	2021/11/10
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2020/12/11	2021/12/10
Loop Antenna	ETS lindgren	6502	00213440	2020/12/25	2021/12/24
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2021/1/13	2022/1/12
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2020/6/9 2021/6/8	2021/6/8 2022/6/7
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2021/1/22	2022/1/21
Temperature & Humidity Test Chamber	GIANT FORCE	GTH-150-40-CP-AR	MAA1701-010	2021/3/22	2022/3/21
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2020/11/17	2021/11/16
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2020/8/19	2021/8/18
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2020/8/12	2021/8/11
Cables	TITAN	CFD200	T0732ACFD2 0020A300-1	2021/3/2	2022/3/1

UL Software		
Description	Name	Version
Radiated measurement	e3	6.191211 (V6)
AC power Line Conducted Emission	EZ_EMCA	UL-3A1.2

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



8. Description of Test Setup

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	AC Adapter	MASS POWER	NBS10B0502000VUU	N/A	Provide by Client
B	Headset	TECO	XYFSE005	-	Provide by Lab

I/O Cables

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	USB to Type C Cable	N/A	N/A	1.2	Provide by Client

Test Setup

Controlled using a bespoke application (P-Test) on a test Notebook. The application was used to enable a continuous transmission mode.

Underwriters Laboratories Taiwan Co., Ltd.

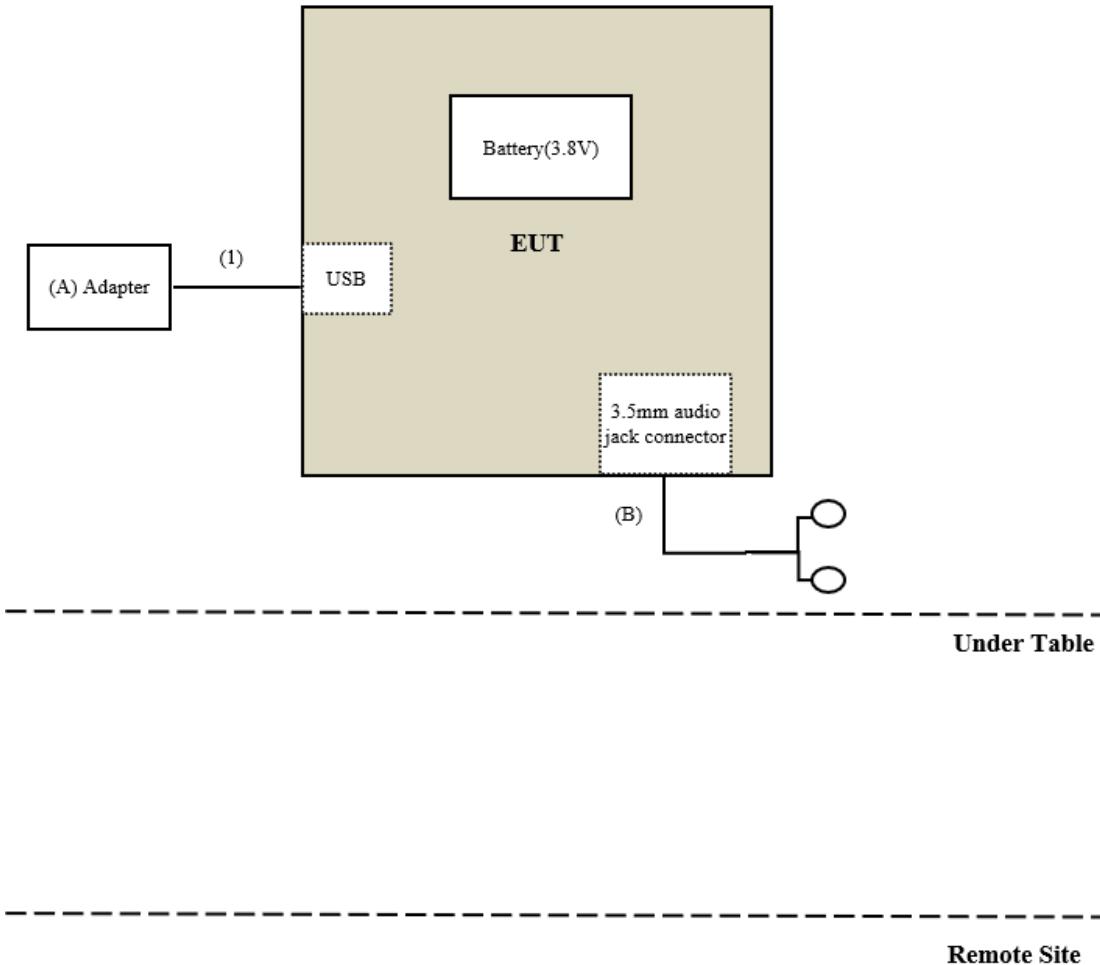
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0

Setup Diagram for Test



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



9. Test Result

9.1. Radiated Spurious Emission

Requirements

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 as below table:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



Test Procedures

[For 9 kHz ~ 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

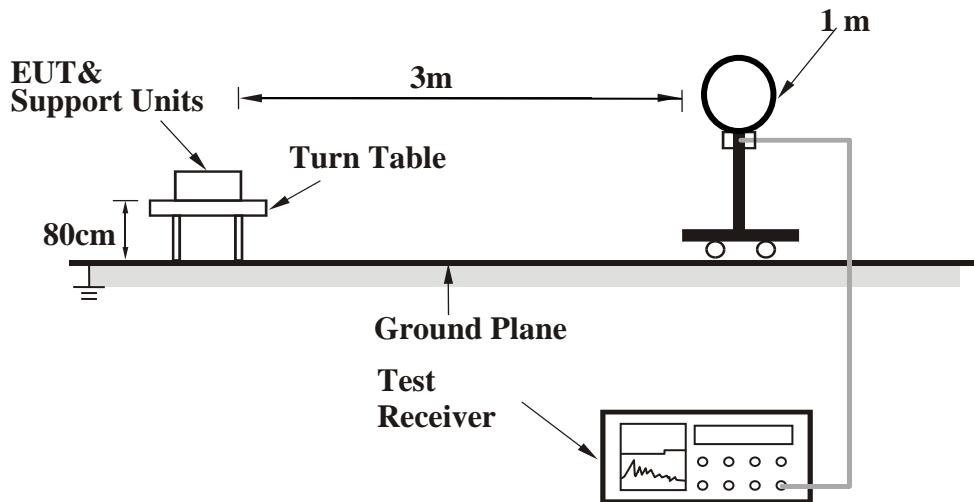
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

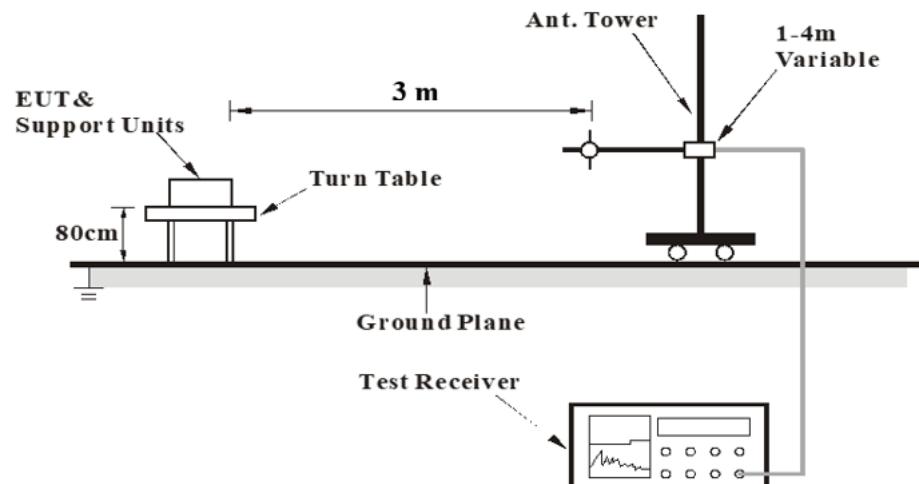
Doc No: 17-EM-F0875 / 5.0

Test Setup

<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



For the actual test configuration, please refer to the Setup Configurations.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

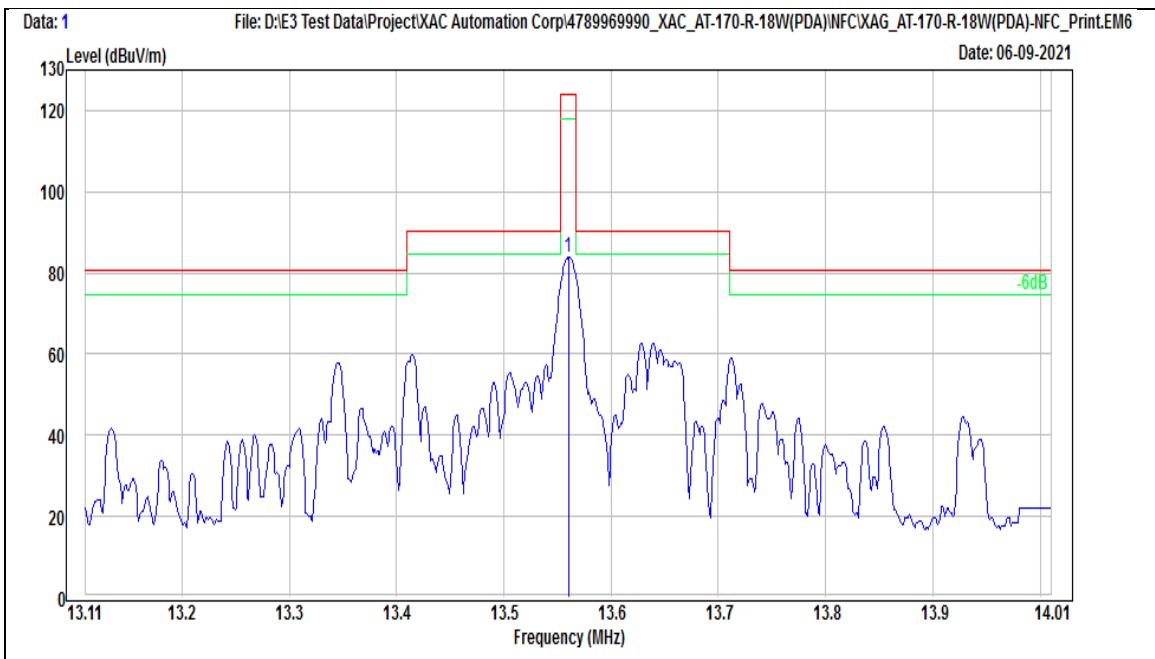
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



Test Data

EUT Test Condition			
Frequency Range	13.11 ~ 14.01MHz	Antenna Polarity	Parallel



Notation	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.56	71.04	12.75	83.79	124	-40.21	Peak

Note :

1. Result (dBuV/m) = Reading (dBuV/m) + Correct (dB/m)
2. Margin (dB) = Result (dBuV/m) - Limit (dBuV/m)
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. Above limits have been translated by the formula.
5. The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

$$\begin{aligned} 13.56\text{MHz} &= 15848\text{uV/m} & 30\text{m} \\ &= 84\text{dBuV/m} & 30\text{m} \\ &= 84+20\log(30/3)^2 & 3\text{m} \\ &= 124\text{dBuV/m} \end{aligned}$$

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

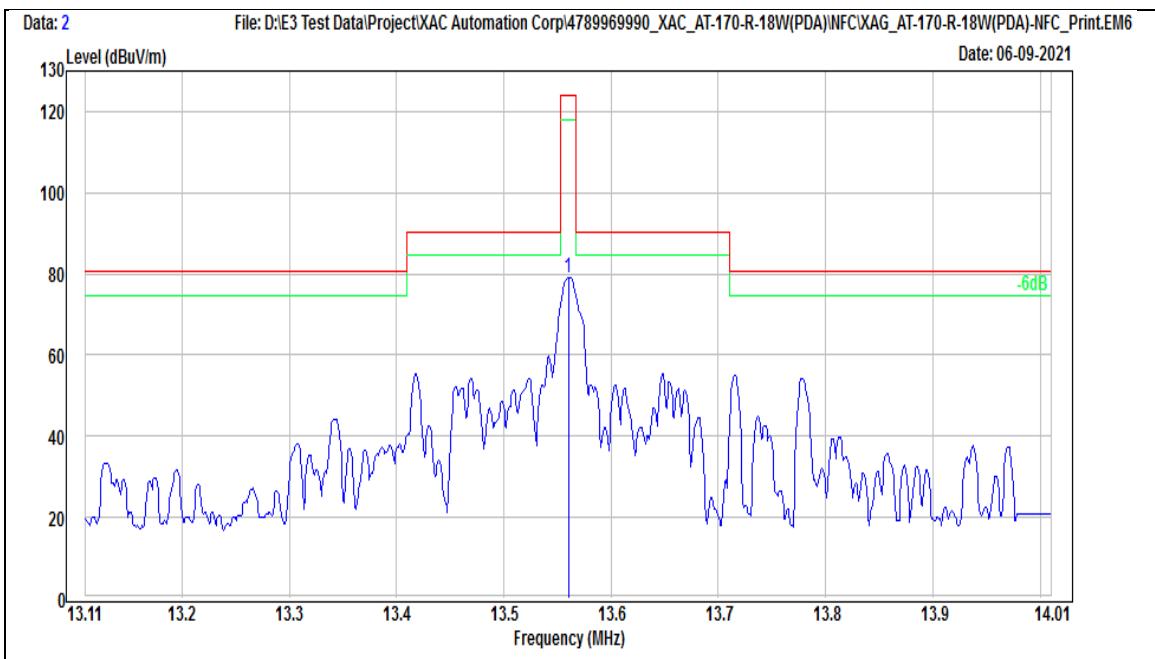
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



EUT Test Condition

Frequency Range	13.11 ~ 14.01MHz	Antenna Polarity	Perpendicular
------------------------	------------------	-------------------------	---------------



Notation	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.56	66.49	12.75	79.24	124	-44.76	Peak

Note :

1. Result (dBuV/m) = Reading (dBuV/m) + Correct (dB/m)
2. Margin (dB) = Result (dBuV/m) - Limit (dBuV/m)
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. Above limits have been translated by the formula.
5. The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

$$\begin{aligned} 13.56\text{MHz} &= 15848\text{uV/m} & 30\text{m} \\ &= 84\text{dBuV/m} & 30\text{m} \\ &= 84+20\log(30/3)^2 & 3\text{m} \\ &= 124\text{dBuV/m} \end{aligned}$$

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

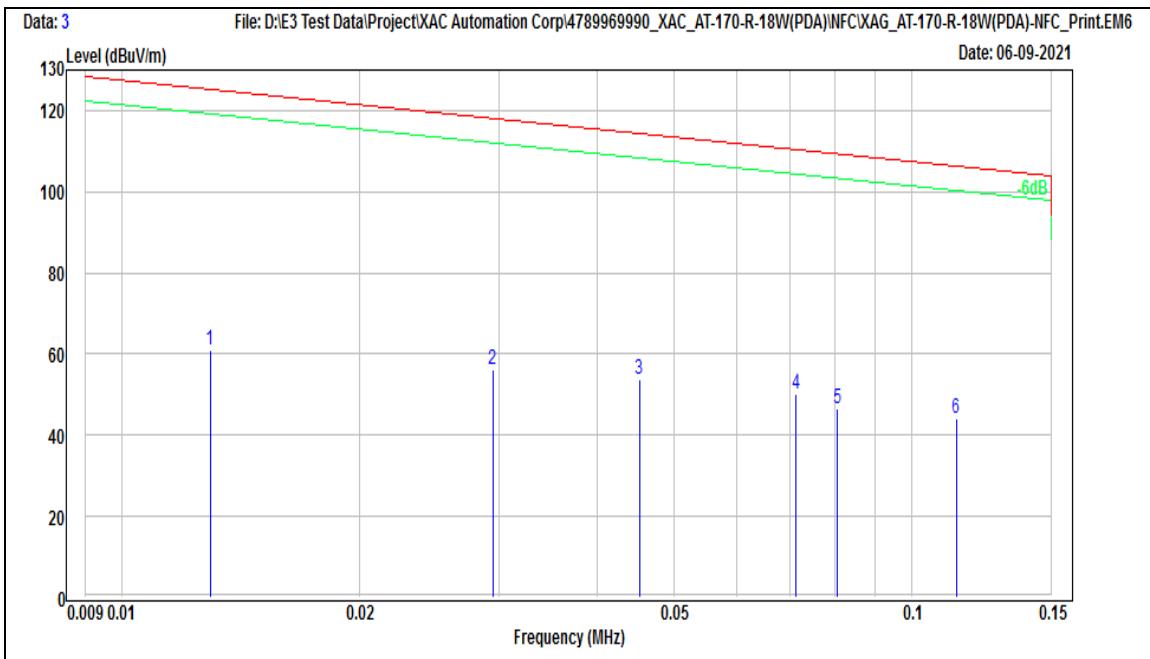
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



EUT Test Condition

Frequency Range	9 kHz ~ 0.15 MHz	Antenna Polarity	Parallel
-----------------	------------------	------------------	----------



Notation	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.01294	44.28	16.86	61.14	125.37	-64.23	Peak
2	0.0295	41.75	14.31	56.06	118.21	-62.15	Peak
3	0.04525	40.29	13.46	53.75	114.49	-60.74	Peak
4	0.07137	37.72	12.5	50.22	110.53	-60.31	Peak
5	0.08055	34.24	12.24	46.48	109.48	-63	Peak
6	0.11385	32.25	11.86	44.11	106.48	-62.37	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

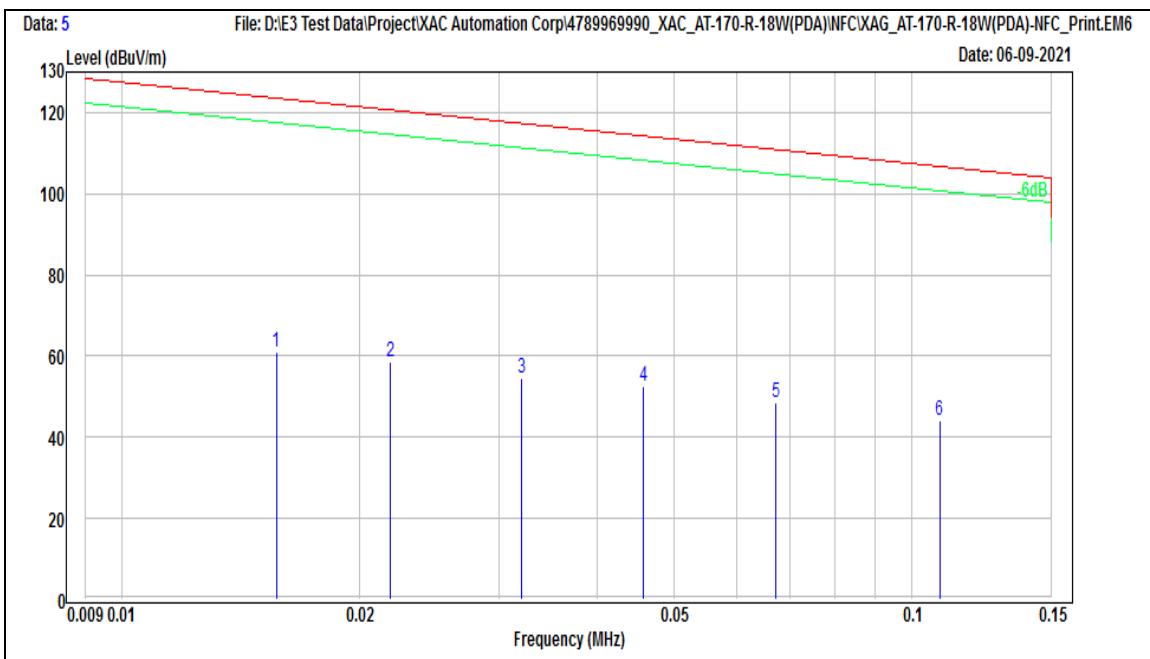
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



EUT Test Condition

Frequency Range	9 kHz ~ 0.15 MHz	Antenna Polarity	Perpendicular
-----------------	------------------	------------------	---------------



Notation	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.01571	44.92	16.26	61.18	123.68	-62.5	Peak
2	0.0219	43.31	15.23	58.54	120.8	-62.26	Peak
3	0.0321	40.39	14.13	54.52	117.47	-62.95	Peak
4	0.04576	39.24	13.43	52.67	114.39	-61.72	Peak
5	0.06728	36.01	12.63	48.64	111.05	-62.41	Peak
6	0.10854	32.44	11.83	44.27	106.89	-62.62	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

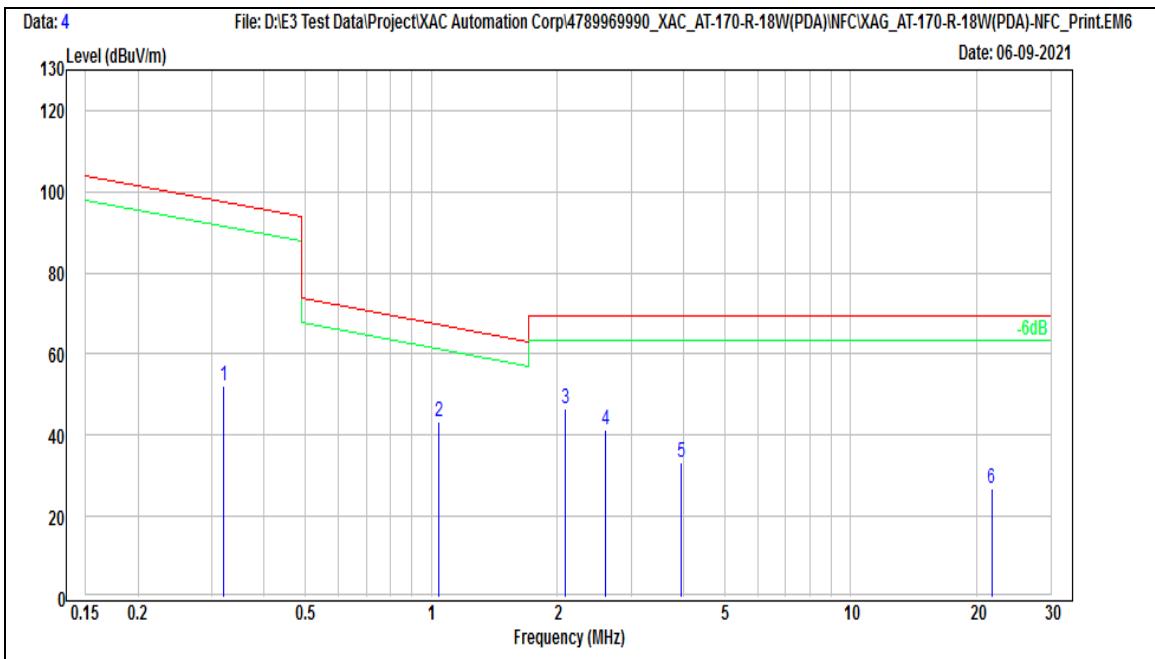
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



EUT Test Condition

Frequency Range	0.15 MHz ~ 30 MHz	Antenna Polarity	Parallel
-----------------	-------------------	------------------	----------



Notation	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.31999	39.75	12.5	52.25	97.5	-45.25	Peak
2	1.043	30.71	12.56	43.27	67.24	-23.97	Peak
3	2.088	34.12	12.24	46.36	69.54	-23.18	Peak
4	2.608	29.24	12.14	41.38	69.54	-28.16	Peak
5	3.943	21.02	12.11	33.13	69.54	-36.41	Peak
6	21.715	14.89	12.03	26.92	69.54	-42.62	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

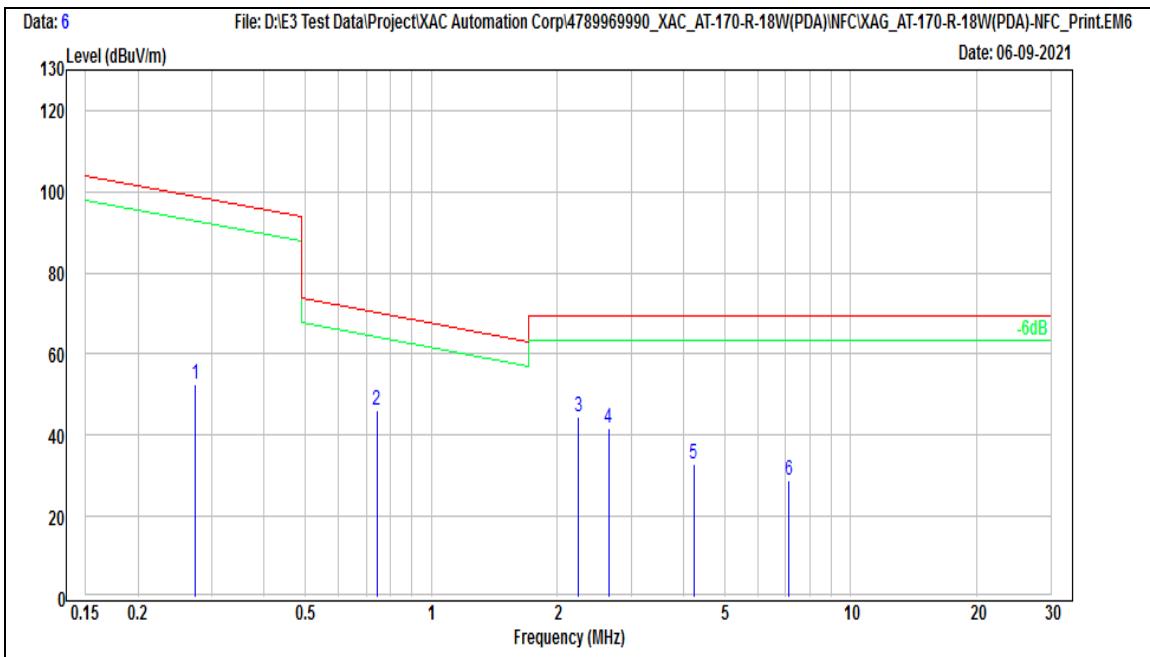
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



EUT Test Condition

Frequency Range	0.15 MHz ~ 30 MHz	Antenna Polarity	Perpendicular
-----------------	-------------------	------------------	---------------



Notation	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.27442	40.22	12.44	52.66	98.83	-46.17	Peak
2	0.74302	33.56	12.51	46.07	70.18	-24.11	Peak
3	2.249	32.18	12.2	44.38	69.54	-25.16	Peak
4	2.65	29.78	12.13	41.91	69.54	-27.63	Peak
5	4.224	20.86	12.11	32.97	69.54	-36.57	Peak
6	7.137	16.45	12.6	29.05	69.54	-40.49	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

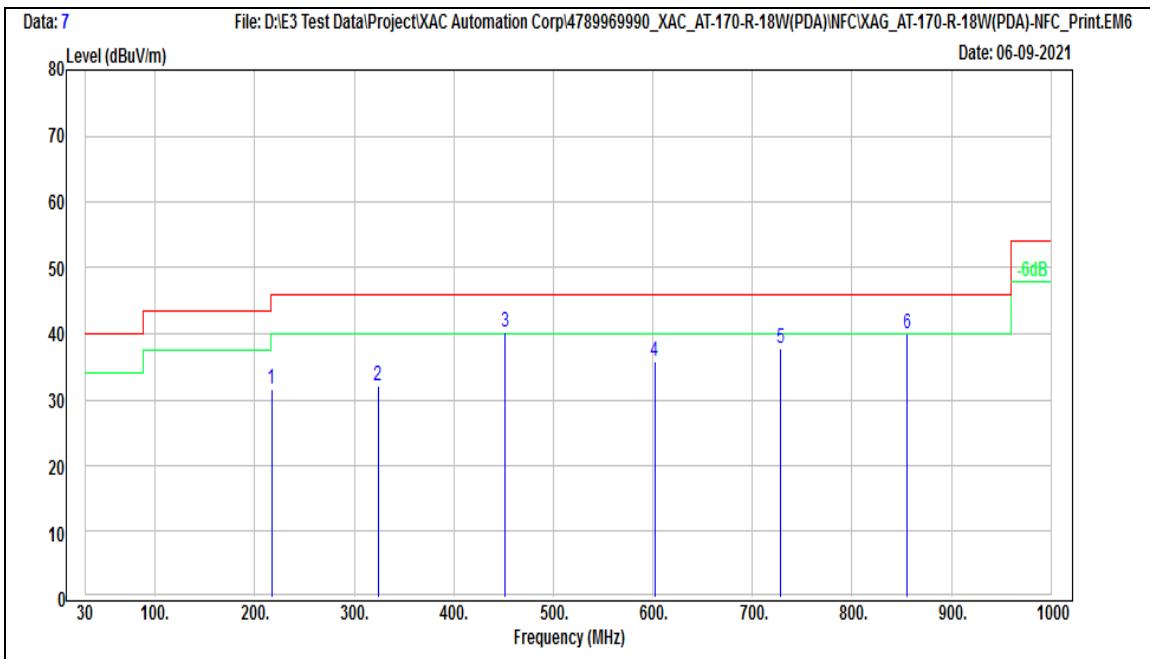
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



EUT Test Condition

Frequency Range	30MHz ~ 1 GHz	Antenna Polarity	Horizontal
-----------------	---------------	------------------	------------



Notation	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	217.21	45.01	-13.32	31.69	46	-14.31	Peak
2	323.91	41.31	-9.18	32.13	46	-13.87	Peak
3	451.95	45.8	-5.55	40.25	46	-5.75	Peak
4	602.3	37.79	-1.92	35.87	46	-10.13	Peak
5	728.4	37.66	0.18	37.84	46	-8.16	Peak
6	855.47	37.74	2.15	39.89	46	-6.11	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The peak result complies with QP limit, QP result is deemed to comply with QP limit.
5. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

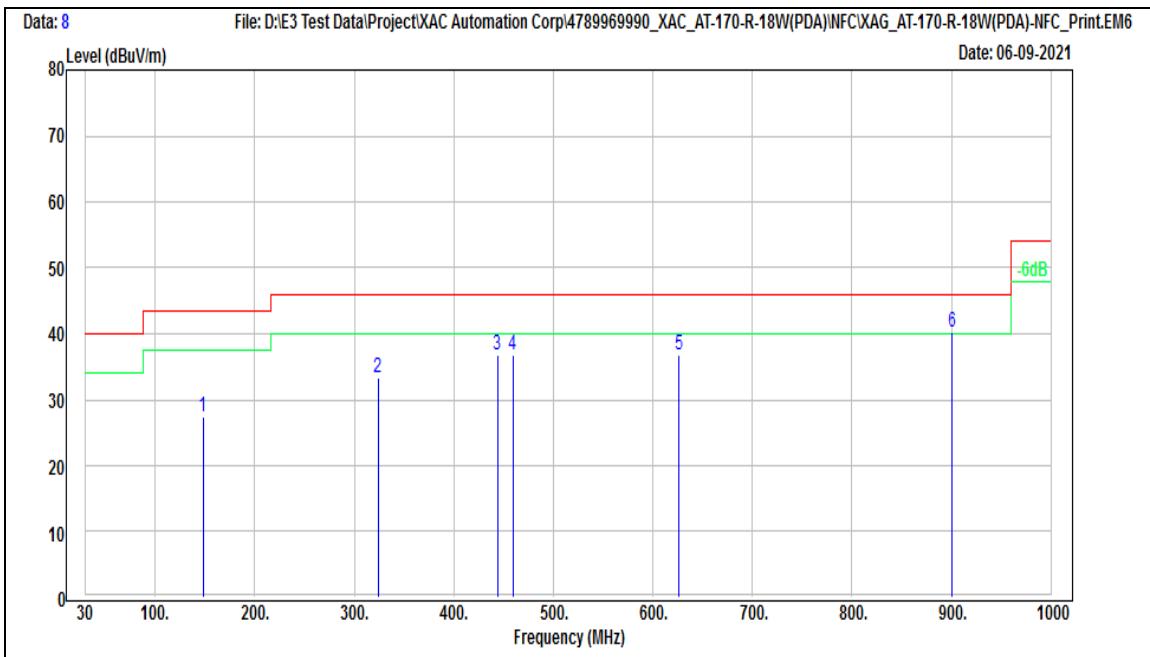
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



EUT Test Condition

Frequency Range	30MHz ~ 1 GHz	Antenna Polarity	Vertical
-----------------	---------------	------------------	----------



Notation	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	148.34	39.01	-11.54	27.47	43.5	-16.03	Peak
2	323.91	42.56	-9.18	33.38	46	-12.62	Peak
3	444.19	42.64	-5.82	36.82	46	-9.18	Peak
4	459.71	42.21	-5.42	36.79	46	-9.21	Peak
5	626.55	38.6	-1.7	36.9	46	-9.1	Peak
6	901.06	37.25	2.92	40.17	46	-5.83	Peak

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The peak result complies with QP limit, QP result is deemed to comply with QP limit.
5. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



9.2. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

Underwriters Laboratories Taiwan Co., Ltd.

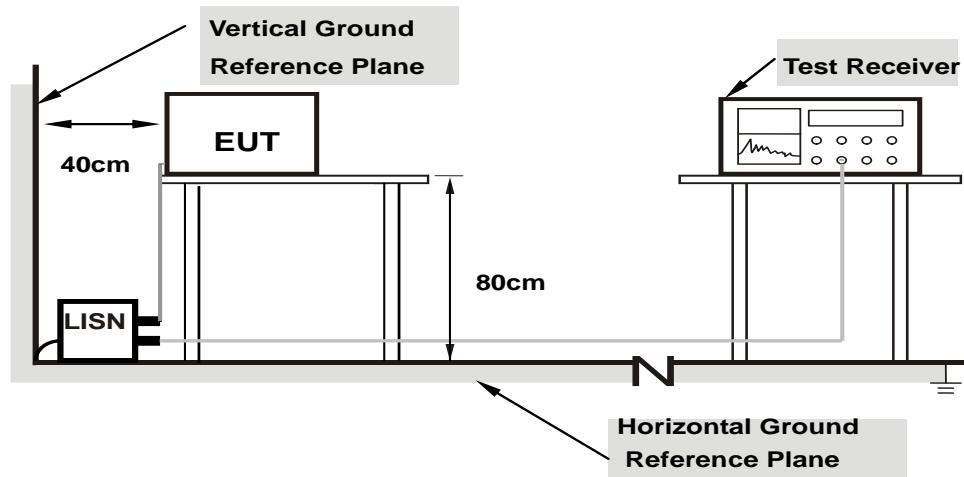
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0875 / 5.0

Test Setup



Note: 1. Support units were connected to second LISN.

For the actual test configuration, please refer to the Setup Configurations.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0

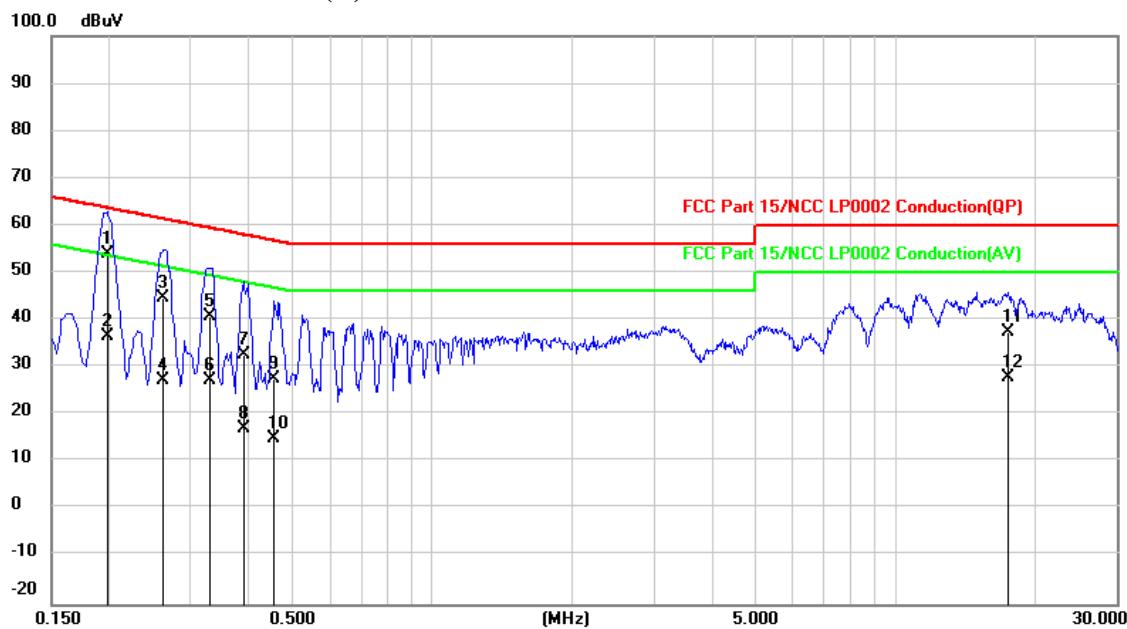


Test report No. : 4789969990-US-R5-V0
Page : 29 of 36
Issued date : 2021/8/3
FCC ID : MQT-AT170R18W

Test Data

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	150 kHz ~ 30 MHz

Phase of Power : Line (L)



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1980	34.54	19.49	54.03	63.69	-9.66	QP
2	0.1980	16.97	19.49	36.46	53.69	-17.23	AVG
3	0.2620	25.06	19.49	44.55	61.37	-16.82	QP
4	0.2620	7.84	19.49	27.33	51.37	-24.04	AVG
5	0.3300	21.34	19.48	40.82	59.45	-18.63	QP
6	0.3300	7.92	19.48	27.40	49.45	-22.05	AVG
7	0.3899	13.31	19.48	32.79	58.07	-25.28	QP
8	0.3899	-2.32	19.48	17.16	48.07	-30.91	AVG
9	0.4540	8.22	19.48	27.70	56.80	-29.10	QP
10	0.4540	-4.44	19.48	15.04	46.80	-31.76	AVG
11	17.4980	17.69	19.74	37.43	60.00	-22.57	QP
12	17.4980	7.97	19.74	27.71	50.00	-22.29	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

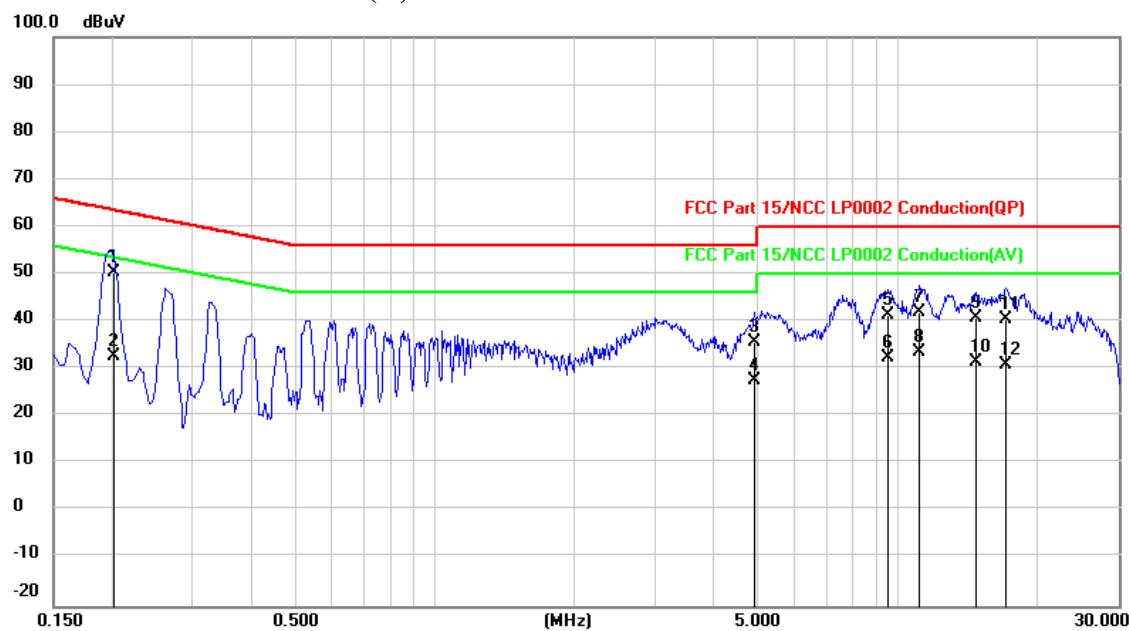
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



Test report No. : 4789969990-US-R5-V0
Page : 31 of 36
Issued date : 2021/8/3
FCC ID : MQT-AT170R18W

Phase of Power : Neutral (N)



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.2020	30.73	19.49	50.22	63.53	-13.31	QP
2	0.2020	13.09	19.49	32.58	53.53	-20.95	AVG
3	4.9060	16.20	19.60	35.80	56.00	-20.20	QP
4	4.9060	7.96	19.60	27.56	46.00	-18.44	AVG
5	9.5100	21.68	19.69	41.37	60.00	-18.63	QP
6	9.5100	12.81	19.69	32.50	50.00	-17.50	AVG
7	11.1860	22.36	19.71	42.07	60.00	-17.93	QP
8	11.1860	13.88	19.71	33.59	50.00	-16.41	AVG
9	14.7500	20.85	19.77	40.62	60.00	-19.38	QP
10	14.7500	11.61	19.77	31.38	50.00	-18.62	AVG
11	17.1700	20.62	19.79	40.41	60.00	-19.59	QP
12	17.1700	11.12	19.79	30.91	50.00	-19.09	AVG

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0875 / 5.0

9.3. 20dB Bandwidth

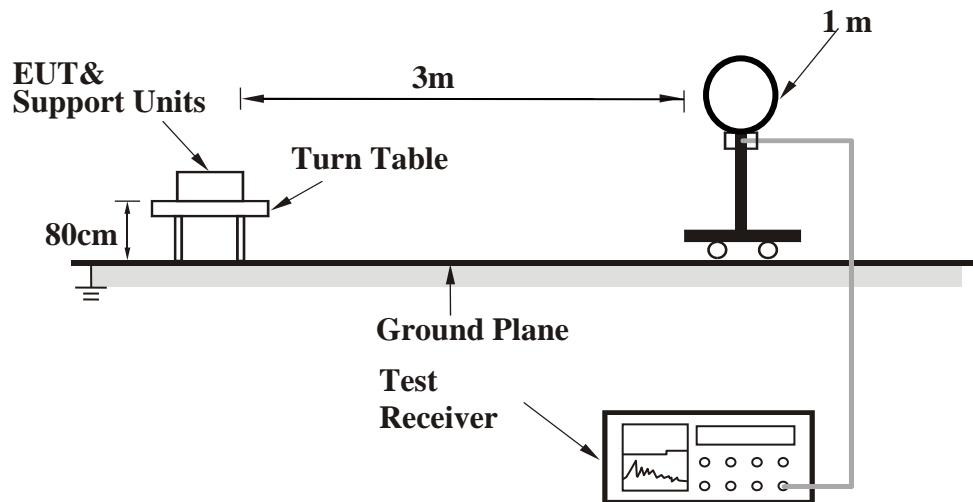
Requirements

The 20 dB bandwidth shall be specified in operating frequency band.

Test Procedures

- a. The testing follows the guidelines in ANSI C63.10-2013.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room.
- c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1kHz RBW and 3kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

Test Setup



For the actual test configuration, please refer to the Setup Configurations.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

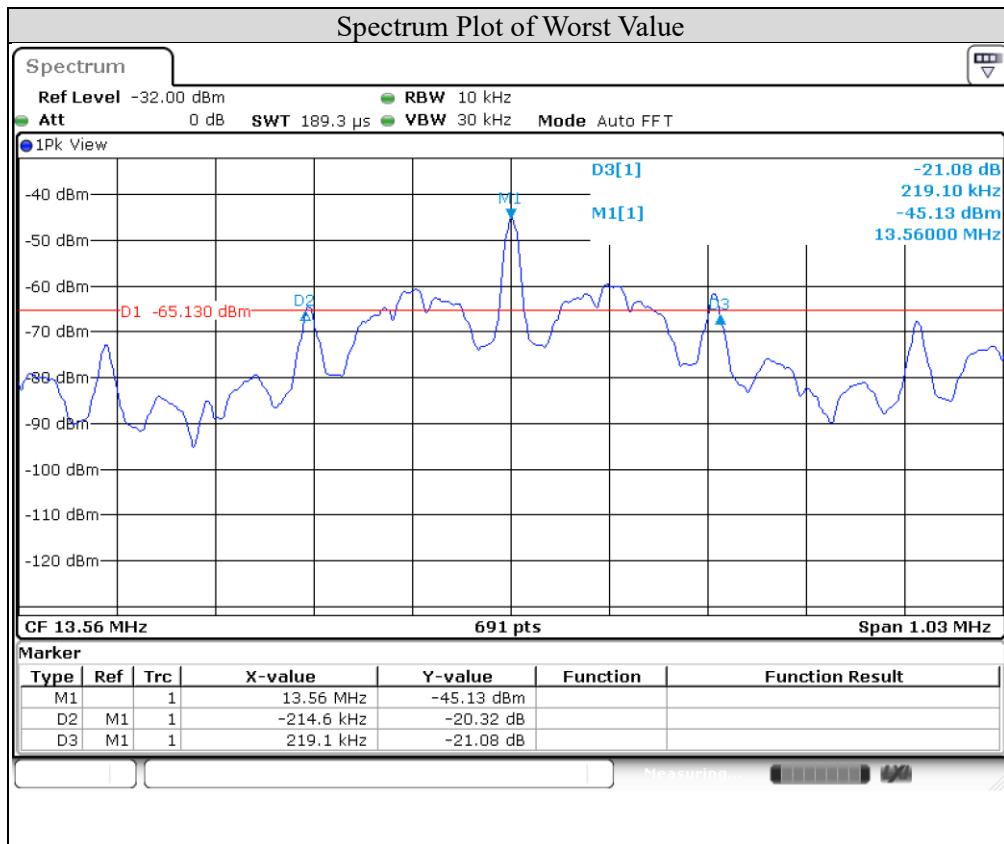
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0

Test Data

Channel	Frequency (MHz)	20dB Bandwidth (kHz)
1	13.56	433.7



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0

9.4. Frequency Stability

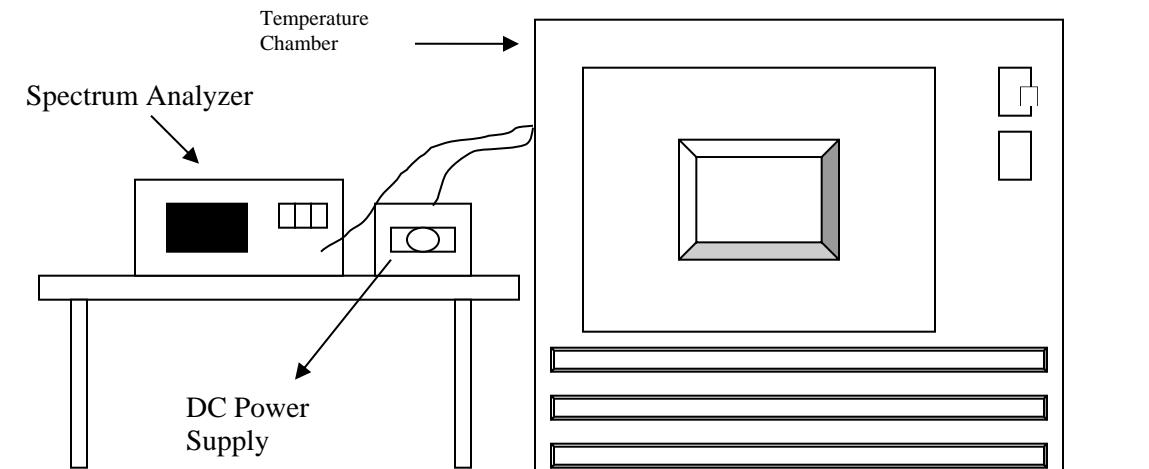
Requirements

The frequency tolerance of the carrier signal shall be maintained within ± 100 ppm of the operating frequency over a temperature variation of –20 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

Test Procedures

- a. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
- b. Turned the EUT on and coupled its output to a spectrum analyzer.
- c. Turned the EUT off and set the chamber to the highest temperature specified.
- d. Allowed sufficient time (approximately 30 min) for the temperature of the chamber to stabilize then turned the EUT on and measured the operating frequency after 2, 5, and 10 minutes.
- e. Repeated step 2 and 3 with the temperature chamber set to the lowest temperature.
- f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

Test Setup



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0



Test Data

Frequency Stability Versus Temp.									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)						
50	3.8	13.56005	3.69	13.56005	3.69	13.56004	2.95	13.56004	2.95
40	3.8	13.56002	1.47	13.56002	1.47	13.56002	1.47	13.56002	1.47
30	3.8	13.56	0.00	13.56	0.00	13.56	0.00	13.55999	-0.74
20	3.8	13.55998	-1.47	13.55997	-2.21	13.55997	-2.21	13.55997	-2.21
10	3.8	13.55996	-2.95	13.55995	-3.69	13.55995	-3.69	13.55995	-3.69
0	3.8	13.55994	-4.42	13.55994	-4.42	13.55994	-4.42	13.55994	-4.42
-10	3.8	13.55994	-4.42	13.55994	-4.42	13.55993	-5.16	13.55993	-5.16
-20	3.8	13.55993	-5.16	13.55993	-5.16	13.55992	-5.90	13.55992	-5.90
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)						
20	4.37	13.55998	-1.47	13.55997	-2.21	13.55997	-2.21	13.55997	-2.21
20	3.8	13.55998	-1.47	13.55997	-2.21	13.55997	-2.21	13.55997	-2.21
20	3.23	13.55998	-1.47	13.55997	-2.21	13.55997	-2.21	13.55997	-2.21

END OF REPORT

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0875 / 5.0